

1 WHAT IS CLAIMED IS:

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3 1. A process for oligomerizing a Fischer-Tropsch derived feed containing
4 oxygenates which comprises:

5

6 (a) reducing significantly the oxygenates present in the
7 Fischer-Tropsch derived feed by contacting said feed with a
8 hydrotreating catalyst under hydrotreating conditions in a
9 hydrotreating zone and recovering from the hydrotreating zone a
10 Fischer-Tropsch derived hydrotreated feed which contains a
11 significantly reduced amount of oxygenates as compared to the
12 Fischer-Tropsch derived feed and also a significant amount of
13 paraffins;

14

15 (b) pyrolyzing the Fischer-Tropsch derived hydrotreated feed in a
16 thermal cracking zone under thermal cracking conditions
17 pre-selected to crack the paraffin molecules to form olefins and
18 collecting an olefin-enriched Fischer-Tropsch feed from the
19 thermal cracking zone;

20

21 (c) contacting the olefin-enriched Fischer-Tropsch feed with a Lewis
22 acid ionic liquid catalyst in an oligomerization zone under
23 oligomerization reaction conditions; and

24

25 (d) recovering from the oligomerization zone a Fischer-Tropsch
26 derived product having molecules characterized by a higher
27 average molecular weight and increased branching as
28 compared to the Fischer-Tropsch derived feed.

29

30 2. The process of claim 1 wherein the Fischer-Tropsch derived
31 hydrotreated feed is substantially free of oxygenates.

- 1 3. The process of claim 2 wherein the Fischer-Tropsch derived
2 hydrotreated feed contains less than 200 ppmw elemental oxygen.
3
- 4 4. The process of claim 3 wherein the Fischer-Tropsch derived
5 hydrotreated feed contains less than 100 ppmw elemental oxygen.
6
- 7 5. The process of claim 1 wherein the hydrotreating catalyst is a
8 non-acidic hydrotreating catalyst.
9
- 10 6. The process of claim 5 wherein the hydrotreating catalyst contains the
11 metal nickel and molybdenum.
12
- 13 7. The process of claim 1 wherein the hydrotreating conditions in the
14 hydrotreating zone include a temperature of between about
15 400 degrees F and about 800 degrees F, an LHSV of between about
16 0.5 and about 5.0, and a total pressure between about 200 psig and
17 about 2,000 psig.
18
- 19 8. The process of claim 7 wherein the temperature in the hydrotreating
20 zone is less than about 675 degrees F.
21
- 22 9. The process of claim 7 wherein the LHSV is between about 1 and
23 about 4.0.
24
- 25 10. The process of claim 1 wherein the temperature in the thermal cracking
26 zone is within the range of from about 950 degrees F and about
27 1,600 degrees F.
28
- 29 11. The process of claim 1 wherein the pressure in the thermal cracking
30 zone is within the range of from about to about 0 atmospheres and
31 about 5 atmospheres.

- 1 12. The process of claim 11 wherein the pressure in the thermal cracking
2 zone is within the range of from about 0 atmospheres and
3 about 2 atmospheres.
4
- 5 13. The process of claim 1 wherein the cracking conversion in the thermal
6 cracking zone is greater than about 10 weight percent of the paraffins
7 present.
8
- 9 14. The process of claim 1 wherein the ionic liquid oligomerization catalyst
10 comprises a first component and a second component, said first
11 component comprising a compound selected from the group consisting
12 of aluminum halide, alkyl aluminum halide, gallium halide, and alkyl
13 gallium halide, and said second component is a quaternary ammonium,
14 or quaternary phosphonium salt.
15
- 16 15. The process of claim 14 wherein the ratio of the first component to the
17 second component is within the range of from about 1:1 to about 2:1.
18
- 19 16. The process of claim 14 wherein said first component is aluminum
20 halide or alkyl aluminum halide.
21
- 22 17. The process of claim 14 wherein said second component is selected
23 from one or more of hydrocarbyl substituted ammonium halide,
24 hydrocarbyl substituted imidazolium halide, hydrocarbyl substituted
25 pyridinium halide, alkylene substituted pyridinium dihalide, or
26 hydrocarbyl substituted phosphonium halide.
27
- 28 18. The process of claim 1 including the additional step of dewaxing the
29 Fischer-Tropsch derived product recovered from the oligomerization
30 zone and collecting a dewaxed Fischer-Tropsch product having
31 improved cold flow properties relative to the Fischer-Tropsch derived
32 product recovered from the oligomerization zone.

- 1 19. The process of claim 18 wherein the Fischer-Tropsch derived product
2 is catalytically dewaxed.
3
- 4 20. The process of claim 18 including the additional step of hydrofinishing
5 the dewaxed Fischer-Tropsch product.
6
- 7 21. The process of claim 1 wherein the Fischer-Tropsch derived product
8 includes lubricant base oil.
9
- 10 22. The process of claim 1 wherein the Fischer-Tropsch derived product
11 includes a diesel product.
12
- 13 23. A process for producing Fischer-Tropsch derived lubricant base oil
14 which comprises:
15
- 16 (a) recovering from a Fischer-Tropsch plant a wax fraction;
17
- 18 (b) reducing significantly the oxygenates present in the
19 Fischer-Tropsch wax fraction by contacting said wax fraction
20 with a hydrotreating catalyst under hydrotreating conditions in a
21 hydrotreating zone and recovering from the hydrotreating zone a
22 hydrotreated Fischer-Tropsch derived wax feed which contains
23 a significantly reduced amount of oxygenates as compared to
24 the Fischer-Tropsch derived wax fraction and also a significant
25 amount of paraffins;
26
- 27 (c) pyrolyzing the hydrotreated Fischer-Tropsch derived wax feed in
28 a thermal cracking zone under thermal cracking conditions
29 pre-selected to crack the paraffin molecules to form olefins and
30 collecting an olefin-enriched Fischer-Tropsch feed from the
31 thermal cracking zone;

- 1 (d) contacting the olefin-enriched Fischer-Tropsch feed with a Lewis
2 acid ionic liquid catalyst in an oligomerization zone under
3 oligomerization reaction conditions;
4
- 5 (e) recovering from the oligomerization zone a Fischer-Tropsch
6 derived oligomerization effluent having molecules characterized
7 by a higher average molecular weight and increased branching
8 as compared to the Fischer-Tropsch derived feed;
9
- 10 (f) catalytically dewaxing the Fischer-Tropsch derived
11 oligomerization effluent by contacting the Fischer-Tropsch
12 derived oligomerization effluent with a dewaxing catalyst under
13 catalytic conditions in a dewaxing zone and collecting a
14 dewaxed Fischer-Tropsch product from the dewaxing zone
15 having improved cold flow properties relative to the
16 Fischer-Tropsch derived oligomerization effluent;
17
- 18 (g) hydrofinishing the dewaxed Fischer-Tropsch product in a
19 hydrofinishing zone under hydrofinishing conditions in the
20 presence of a hydrofinishing catalyst; and
21
- 22 (h) collecting a Fischer-Tropsch derived lubricant base oil from the
23 hydrofinishing zone.
24
- 25 24. The process of claim 23 wherein the oxygenates in the hydrotreated
26 Fischer-Tropsch derived wax feed recovered from the hydrotreating
27 zone is substantially oxygenate free.
- 28 25. The process of claim 24 wherein the hydrotreated Fischer-Tropsch
29 derived wax feed recovered from the hydrotreating zone contains less
30 than 200 ppmw elemental oxygen.

- 1 26. A process for producing Fischer-Tropsch derived lubricant base oil
2 which comprises:
3
4 (a) recovering from a Fischer-Tropsch plant a condensate fraction;
5
6 (b) removing substantially all of the oxygenates present in the
7 Fischer-Tropsch condensate fraction by contacting said
8 condensate fraction with a hydrotreating catalyst under
9 hydrotreating conditions in a hydrotreating zone and recovering
10 from the hydrotreating zone a substantially oxygenate-free
11 Fischer-Tropsch derived condensate feed which also contains a
12 significant amount of paraffins;
13
14 (c) pyrolyzing the substantially oxygenate-free Fischer-Tropsch
15 derived condensate feed in a thermal cracking zone under
16 thermal cracking conditions pre-selected to crack the paraffin
17 molecules to form olefins and collecting an olefin-enriched
18 Fischer-Tropsch feed from the thermal cracking zone;
19
20 (d) contacting the olefin-enriched Fischer-Tropsch feed with a Lewis
21 acid ionic liquid catalyst in an oligomerization zone under
22 oligomerization reaction conditions;
23
24 (e) recovering from the oligomerization zone a Fischer-Tropsch
25 derived oligomerization effluent having molecules characterized
26 by a higher average molecular weight and increased branching
27 as compared to the Fischer-Tropsch derived feed;
28
29 (f) catalytically dewaxing the Fischer-Tropsch derived
30 oligomerization effluent by contacting the Fischer-Tropsch
31 derived oligomerization effluent with a dewaxing catalyst under
32 catalytic conditions in a dewaxing zone and collecting a
 dewaxed Fischer-Tropsch product from the dewaxing zone

- 1 having improved cold flow properties relative to the
2 Fischer-Tropsch derived oligomerization effluent;
3
4 (g) hydrofinishing the dewaxed Fischer-Tropsch product in a
5 hydrofinishing zone under hydrofinishing conditions in the
6 presence of a hydrofinishing catalyst; and
7
8 (h) collecting a Fischer-Tropsch derived lubricant base oil from the
9 hydrofinishing zone.
10
11 27. The process of claim 26 wherein the substantially oxygenate-free
12 Fischer-Tropsch derived condensate feed recovered from the
13 hydrotreating zone contains less than 200 ppmw elemental oxygen.
14
15 28. The process of claim 27 wherein the substantially oxygenate-free
16 Fischer-Tropsch derived condensate feed recovered from the
17 hydrotreating zone contains less than 100 ppmw elemental oxygen.
18
19 29. The process of claim 26 wherein a diesel product is also collected from
20 the hydrofinishing zone.